Article

Impact of periodicity and stochastic impact on COVID-19 pandemic: A mathematical model

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Abstract

We analyzed the features of the COVID-19 outbreak with temporal delay and stochastic influence using the SIRS epidemic model in this study. We investigate the local stability of each equilibrium point in terms of basic reproduction numbers. Hopf bifurcation is detected in the system, and a time delay is inserted in the transmission terms to represent the virus's incubation period. The spread of the novel COVID-19 strain to humans is influenced by environmental conditions such as mugginess, precipitation, and temperature. To explore the impact of environmental oscillations on the coronavirus, we employ white noise perturbations in the system. Finally, we examine the mathematical reenactments using MATLAB.

Keywords COVID-19; stability; Hopf-bifurcation; stochasticity; white noise.

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1 Introduction

COVID-19, a fast spreading coronavirus disease, has become a global emergency. This contagious disease is rapidly spreading, endangering the lives of many people. As a result, timely interventions and thorough examinations are likely to keep the disease at bay in networks (Hui et al., 2020). The COVID-19 pollution manifests itself as COVID-19. Hacking, fever, tiredness, loose bowels, and windedness are all symptoms. COVID-19 typically causes pneumonia and, in severe cases, death (WHO, 2020). COVID-19 has a hatching time of 3–14 days or longer, according to the essential investigations (WHO-China, 2020). Due to various applications of fractional calculus, stochastic modelling and bifurcation analysis (Xu et al., 2017, 2019; Xu et al., 2019a; Xu et al., 2020b; Abdon, 2017, 2018, 2020; Shah et al., 2020), several analysts analyzed this COVID-19 in many models in full and partial requests (Nesteruk, 2020; Okhuese, 2020; Zhou et al., 2020; Bogoch et al., 2020; Ji et al., 2020; Li et al., 2020; Yousaf et al., 2020; Ud Din et al., 2020; Cakan, 2020; Abdo et al., 2020; Khan et al., 2020; Zeb et al., 2020). A few creators considered stochastic models by giving repetitive noises for the more practical models (Tornatore et al., 2005). To be honest, stochastic nuisance

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